From wang!elf.wang.com!ucsd.edu!info-hams-relay Sun Mar 31 09:00:04 1991 remote from tosspot
Received: by tosspot (1.64/waf)
via UUCP; Sun, 31 Mar 91 10:41:48 EST
for lee
Received: from somewhere by elf.wang.com id aa20702; Sun, 31 Mar 91 9:00:02 GMT
Received: from ucsd.edu by relay1.UU.NET with SMTP
(5.61/UUNET-shadow-mx) id AA21331; Sun, 31 Mar 91 01:51:28 -0500
Received: by ucsd.edu; id AA09977
sendmail 5.64/UCSD-2.1-sun
Sat, 30 Mar 91 21:18:43 -0800 for brian
Received: by ucsd.edu; id AA09965
sendmail 5.64/UCSD-2.1-sun
Sat, 30 Mar 91 21:18:39 -0800 for /usr/lib/sendmail -oc -odb -oQ/var/spool/lqueue -oi -finfo-hams-relay info-hams-list
Message-Id: <9103310518.AA09965@ucsd.edu>
Date: Sat, 30 Mar 91 21:18:37 PST
From: Info-Hams Mailing List and Newsgroup <info-hams-relay@ucsd.edu>
Reply-To: Info-Hams@ucsd.edu
Subject: Info-Hams Digest V91 #253
To: Info-Hams@ucsd.edu

Info-Hams Digest   Sat, 30 Mar 91   Volume 91 : Issue 253

Today's Topics:

a few fundamental questions about RF signals (2 msgs)
Antenna matching problem for novice
ATV: AM or FM (2 msgs)
large 110->220 transformers (2 msgs)
Morse Code programs for the Amiga?
NASA Prediction Bulletins
Re: Newer HF rigs
VHF/UHF antenna design [a mathematical approach]

Send Replies or notes for publication to: <Info-Hams@UCSD.Edu>
Send subscription requests to: <Info-Hams-REQUEST@UCSD.Edu>
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Info-Hams Digest are available (by FTP only) from UCSD.Edu in directory "mailarchives/info-hams".

We trust that readers are intelligent enough to realize that all text herein consists of personal comments and does not represent the official policies or positions of any party. Your mileage may vary. So there.

Date: 28 Mar 91 12:53:43 GMT

From: ucselx!sol.ctr.columbia.edu!emory!wa4mei!ke4zv!gary@ucsd.edu
Subject: a few fundamental questions about RF signals
To: info-hams@ucsd.edu

In article <9171@plains.NoDak.edu> kkim@plains.NoDak.edu (kyongsok kim) writes:
>
>   I don't know much about radio frequency signals and have some
>fundamental questions. Please enlighten me (hopefully in easy terms)...
>
>   1. Recently CATV interferance was discussed. I wonder if the
>same RF signal can travel either through copper wire or through air. In
>other words, is there no difference between RF signal (say, for channel
>4) that my TV receives from the air and RF signal (say, for channel 4)
>coming from CATV company through cable?

RF is RF. The TV signal in the cable is identical to the TV signal sent
over the air. There are a few caveats however. One, the cable system
may use a different channel plan than the over the air broadcaster.
Cable channel 4 *could* be a different frequency than broadcast channel
4. This is rare, but some cable companies do it to force you to use
their converter box rather than allowing you to hook up a "cable ready"
set directly. Two, the modulation of cable signals may be scrambled.
This has no effect on the nature of the RF, but it does effect your
ability to watch the channel without the cable company's converter
box. But RF is RF no matter whether it is conducted through a cable
or radiated through the air. There are tons of detail differences
in the modes of propagation of RF on wires and in cables and through
the air, but the nature of the RF is unchanged.

>   2. Are light and RF signals totally distinct or one and the same?
>For example, is visible light just an RF signal whose frequency is in the
>range of the frequency of visible light ?
>   To put this question another way, can we have an RF signal whose
>frequency is the same as that of visible light, but that is still
>distinct from light?

Light is just a higher frequency form of the same radiation that we
call RF at lower frequencies. X-rays and Gamma rays are even higher
frequency forms of the same radiation that we call light and RF at
lower frequencies. There are practical details involved. When we
speak of RF we generally mean a single frequency, coherent signal.
When we speak of light we generally mean sunlight or white light
which is an incoherent mixture of all the frequencies in the visible
spectrum. At RF we would call this signal broad band noise. Lasers
emit single frequency coherent light and are a close cousin of what
we normally think of as a transmitter at the RF frequencies.

Gary KE4ZV

Date: 30 Mar 91 20:34:58 GMT
From: uhura.cc.rochester.edu!uhura!saaf@cs.rochester.edu
Subject: a few fundamental questions about RF signals
To: info-hams@ucsd.edu

Speaking of RF, what is it? It's an acronym for radio frequency. If my vocal chords had the right properties I could yell and create RF. RF refers to the frequency of oscillation, not the type of oscillation.

Okay, I know, when we say RF, what we really mean is an electromagnetic wave that has a frequency of oscillation in what we consider to be in the radio portion of the spectrum. Or do we sometimes mean a current or voltage in an electronic circuit? Can one scenario exist without the other? Yes and no. No, because electromagnetic waves cannot exist without the movement of charged particles. Yes, because electromagnetic waves can exist at arbitrarily large distance from charged particles, moving or not.

I think its about 2 different interpretations (or manifestations) of the same thing. The surroundings in which they occur prejudice us--well, me at least :-) --in their interpretation. If the electric current is nearby, I will describe it in terms of the current. If the current is far away, I will describe it as a wave. For instance, I find it easier to talk about Channel 5's signal in the transmission line in terms of current. I find it easier to talk about Channel 5's signal propagtion from its antenna to mine in terms of an electromagnetic wave. Neither interpretation is the only one.

Good thread--keep it going!

Len
NV2Z

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------------------------------------------------------------------------
| Len Saaf, The Institute of Optics, Univ. of Rochester, Rochester, NY |
| Internet: saaf@joker.optics.rochester.edu        Bitnet: SAAF@UOROPT |
------------------------------------------------------------------------
```

Date: 29 Mar 91 16:04:49 GMT
From: hpda!hpcuhb!hpsqf!hpqmola!hpqmolb!dstock@hplabs.hpl.hp.com

Subject: Antenna matching problem for novice
To: info-hams@ucsd.edu

You should not have to do anything to handle different cable lengths, if your antenna impedance is the same as your cable impedance.

Transmission lines and matching are much simpler than they appear. Unfortunately most people try to explain them with trigonometry not words.

most people don't know what "50 ohm co-ax" means, yet the theory is both elegant and simple...   it also de-fuses much black magic.

OK, here goes my best attempt......

Any electrical conductor will exhibit inductance. As we have not tied down any particular length, we'd better express this as inductance per unit length, usually in Henries-per-metre. Between a pair of conductors like, say the inner and outer of your co-ax, or the two wires of a balanced pair, there will also be capacitance. Again, we can express this as capacitance per unit length, usually farads-per-metre.

The first long lines used for telegraph and telephone had very poor frequency response, giving a low limit on morse speed over the first trans-atlantic cables and baddly muffled speech over only 10's of miles of land lines. Mathematical analysis showed that the capacitance and the inductance had different effects, and that for any given (resistive only) load impedance the effects could be made to cancel each other if the lines were made to have an appropriate ratio of L to C per unit length. It turned out that phone lines had insufficient inductance, so they added "loading coils" every so many kilometres. This made long distance telephony possible. These are the famous "loading coils" now on the surplus market and being used by amateurs to make passive audio filters for CW. All transmission line theory traces back to this work. Doesn't it look odd that adding series inductance actually extended the frequency response ? You could think perhaps of the inductance per unit length "tuning out" the capacitance per unit length, but because the inductance and capacitance are "distributed", the effect is broadband and not frequency-specific as might have been expected.

Imagine a transmitter driving an antenna via a very long feed line. so long that we can pulse the thansmitter on and off as if to send a Morse dot before the first bit of the pulse reaches the end of the line. The most awkward question to ask now is, "what did the transmitter think it was driving?"The answer is a doddle, but the proof is not. If your line was 50ohm cable
then tha transmitter thought it saw 50 ohms. This is the neatest definition of what cable impedance, usually called characteristic impedance means.

So, we now have a burst of RF power whizzing down our line. If we are using 50 ohm line then the ratio of the current at any point at any instant to the voltage at that point and instant will be 50 volts-per-amp or in other words 50 ohms --- look! another easy definition !

When the signal reaches the end of the line, our 50 ohm line presents the antenna simultaneously with voltage and current in the ratio of 50 volts-per-amp -- (another !). If our antenna has been designed to present a good 50 ohm resistive impedance, then this is just what it will accept, so all our power passes into the antenna (and this is what WE want). The antenna and line are said to be matched.

If our antenna looks like a different impedance, then the voltage and current presented to it do not allow it to take the full available power. the power remaining unaccepted is reflected- it bounces back up the line. With a matched antenna/line the power flow is uni-directional, And the transmitter sees a nice 50 ohm load. no signal ever returns to the transmitter so it has no way of knowing the cable length or where the signal is going, it just disappears never to reappear. This is the real value of matched lines. IF YOUR ANTENNA AND ITS FEEDER ARE MATCHED, THEN THE TRANSMITTER SEES A LOAD EQUAL TO THE LINE IMPEDENCE- IRRESPECTIVE OF LINE LENGTH. pure magic :-)

Now, with a mis-matched antenna we have a voltage and current wave (possibly phase shifted relative to each other if the antenna is not purely resistive) travelling back along our line. there will be an interesting pattern of partial cancellation and reinforcement along the line. The pattern will be cyclic and will repeat every 1/2 wave along the line (1/2 wave = 1 wave round -trip distance). If we calculate or measure the voltages and currents along the line we find no more 50 ohms but a value which will vary cyclically along the line, and which is not always purely resistive. A chap called Smith invented some funny graph paper to make these cyclic patterns come out as circles. VSWR is just the ratio of the voltage at a hot spot to that at a cold spot. with a perfect match there are no hot or cold spots so 1:1 is perfection. Most professionals don't use VSWR, they talk of return loss- which is the fraction of power that is reflected. This is easier to visualise.

look, no equations !

Hope this helped
73 de GM4ZNX

Date: 30 Mar 91 23:58:50 GMT
From: unix!snmp.sri.com!larson@husc6.harvard.edu
Subject: ATV: AM or FM
To: info-hams@ucsd.edu

In article <1991Mar29.151052.17122@wam.umd.edu> rustyh@wam.umd.edu (Rusty Haddock)

writes:

>S/N for an 8 MHz p-p deviated signal and CCIR pre-emp (NTSC)
>is equal to Pr - n + 128.6
>
>where Pr is the receivecd level in dBm, n is the noise figure in dBs
>& the 128.6 is the fudge factor which accounts for the conversion units,
>pre-emphasis, FM improvement factor etc...
>
>I've not looked into VSB or AM much so I can't give the figures for that
>but perhaps someone else out there has the formula.

  VSB and AM can be treated as equivalent, the energy in the removed
lower sideband is fairly small.

  For a 1 watt carrier, you can expect 1/2 watt of sidebands. Since black
is at the 70 % point, and all above that is sync, all picture information
other than sync is transmitted with 1/2 the availiable sideband power.
Thus, you have 1/4 watt of picture sidebands. Since you only care about
one of the sidebands, you have 1/8 watt of 'useful' picture power. This
power is spread over about 3.5 - 4 MHz of bandwidth, so your noise floor
is about -108 dBm.

  We can then come up with a formula for AM (VSB) of: Pr - n + 108.
This gives FM about a 20 dB performance advantage.

  A good picture will require over 40 dB s/n after demodulation, 50 to 51
dB would be considered "full quieting".

     Alan

wa6azp

Date: 30 Mar 91 23:39:55 GMT
From: unix!snmp.sri.com!larson@husc6.harvard.edu
Subject: ATV: AM or FM
To: info-hams@ucsd.edu

In article <1018@sousa.enet.dec.com> smith@sndpit.enet.dec.com (Willie Smith)
writes:
>
>In article <1991Mar29.005013.29370@ux1.cso.uiuc.edu>, phil@ux1.cso.uiuc.edu (Phil
Howard KA9WGN) writes...
>>Some of the ATV equipment on the market for 23cm uses FM instead of AM or
>>VSB as its modulation.
>>

>>I'd like to know what the merits in doing this are. I note that the ARRL
>>bandplan for 23cm includes 5 "channels" for ATV that are only 6 MHz wide.

It is particularly offensive that the 23 cm band plans seem to have decided that the only TV is AM VSB. Some of the specific advantages of FM include:

+ Better linearity and greater average transmitted power. Truely linear amplifiers are rare in the amateur community in the VHF and UHF frequency range. The effective power of AM TV is 1/8 the carrier power.
+ Signal to noise ratio improvement at demodulator output.
+ Increased s/n performance through pre- and de-emphasis.
+ Improved co-channel interference immunity.
+ Immunity from fading.

Some of the problems are:

- Equipment complexity. You cannot just convert the frequency down and feed it into your regular TV set.
- Greater signal bandwidth.
- Poor weak signal performance. Below threshold, the signal will be worse than AM. (But, note that AM would be really bad at that point, too.)
- Degradation from multi-path interference.

>I saw (was it here on the net?) a wider channel (12 MHz?) in one of the
>higher bands for FMTV, so I suspect it takes more bandwidth. I'm told that
>the standard for FM ATV deviation is some 16(?) MHz, giving something like
>50 MHz bandwidths [using BW=2(dev+Fmax)]. This gives _really_ nice
>pictures, or so I'm told, but it really chews up bandwidth.

The standard for FM ATV deviation is 4 MHz. For a broadcast quality signal, 4 MHz is a reasonable guess at max deviation, so the BW=2(4+4) which comveniently equals 16 MHz. You had the bandwidth and deviation mixed up, apparently.

This is also the terrestrial FMTV standard, used by lots of TV remote systems -- they often look pretty good.

>On the other tentacle, satellite TV bandwidths are something like 10 MHz,
>including a couple of sound carriers and a digital link, and those are FM,
>so it must work in narrower bandwidths.

No, satellite TV bandwidths are more like 35 MHz. The deviation varies, but can be expected to be around 10 MHz. Since a large part of the energy

is in the central part of the passband, many home receivers use narrower
filters to improve the c/n ratio into the detector, at some expense of
demodulation accuracy.

>>Yet I am told by the maker of the FM equipment that the signal takes no
>>more room than an AM signal.
>
>I think I've talked to the same vendor. His message seems to be "Set the
>deviation so the main carrier takes up the full 6 MHz of allocated
>bandwidth and don't worry about (or let others worry about) the sidebands."
>I might be getting some FMTV gear in the next couple of months, (anything
>has to be better than the AMTV gear I've seen advertized), and I'll be
>trying different deviations, bandwidths, and powers, so hopefully I'll have
>some real numbers to talk about. But it does sound like when I cut the
>deviation way down like that I'll be getting lower (than optimum) picture
>quality and losing the 'capture effect' (which apparently depends on the
>deviation being larger than the highest-modulating-frequency). The quick
>answer seems to be that nobody knows....

I would claim that people do know. After all, the engineers who build
the commercial stuff must know. Apparently, not the folks selling the
stuff, though. It is sad to see the FM sellers so clueless.

Alan

wa6azp

Date: 29 Mar 91 16:57:08 GMT
From: hpda!hpcuhb!hpsqf!hpqmola!hpqmolb!dstock@hplabs.hpl.hp.com
Subject: large 110->220 transformers
To: info-hams@ucsd.edu

Meaty 240 to 110 v transformers are easily available over this side, they
are commonly used to run power tools at safer voltages. the 110v output
may have an earthed (you'll have to get used to some different words :-))
centre tap giving 55-0-55 volts.
Your clock could make a useful conversation piece !

Remember PAL not NTSC TV standards for both TV and VCR.
REmember that we have different pre-emphasis on VHF-FM broadcast radio.

Date: 30 Mar 91 19:47:31 GMT

From: swrinde!zaphod.mps.ohio-state.edu!mips!cs.uoregon.edu!milton!sumax!amc-gw!
thebes!polari!mzenier@ucsd.edu
Subject: large 110->220 transformers
To: info-hams@ucsd.edu

In article <gbwV9z_00jVM4FsFs9@andrew.cmu.edu> dh1s+@andrew.cmu.edu (Donn Hoffman)
writes:
>I am moving to Spain and want to bring several appliances (eg:
>macintosh, fax, blender, stereo).
>
>Power in Spain is 220v/50hz. The appliances are all 110v. Some are
>labeled 60hz, some are labeled 50/60hz.
>
>1. I am reluctant to trust my fax and mac to the cheap travel
>transformers sold at Akbar & Jeff's Luggage Hut. Is there some sort
>of larger, reliable transformer I can get to plug all (or several) of
>my appliances into?

Over there, try an appliance store near a US Military base. According
to ex-miltary friends, 220->110 volt autotransformers are quite common.
If there are some sort of classified adds or for sale bulliten board,
check them. Departing personel don't want to ship a useless converter
back home.

Mark Zenier markz@ssc.uucp mzenier@polari.uucp

Date: 30 Mar 91 00:37:51 GMT
From: vsi1!ubvax!pyramid!ctnews!starfish!irving@ames.arpa
Subject: Morse Code programs for the Amiga?
To: info-hams@ucsd.edu

I would like to find a good morse code program for the amiga. It should
have variable character speed and separate variable word speed to allow
Farnsworth. Reading chars from a file is nice, but does anyone know of
a more advanced program that can generate QSOs like they would appear on
a test? I have sendmorse.c already. There must be something better out
there. There are many such programs for MSDOS.

Don Irving, N6DRB   UNISYS Network Computing Group
irving@.convergent.com   San Jose, CA

Date: 31 Mar 91 03:50:09 GMT
From: news-mail-gateway@ucsd.edu

Subject: NASA Prediction Bulletins
To: info-hams@ucsd.edu

The most current orbital elements from the NASA Prediction Bulletins are carried on the Celestial BBS, (513) 427-0674, and are updated several times weekly. Documentation and tracking software are also available on this system. As a service to the satellite user community, the most current of these elements are uploaded weekly to sci.space. This week's elements are provided below. The Celestial BBS may be accessed 24 hours/day at 300, 1200, or 2400 baud using 8 data bits, 1 stop bit, no parity.

```
- Current NASA Prediction Bulletins #828 -
Alouette 1
1 00424U 62B-A  1 91 87.23677088  .00000616  00000-0  72251-3 0  3937
2 00424  80.4678   6.0121 0022068 264.2913  95.5733 13.67498438421518
ATS 3
1 03029U 67111  A 91 84.83664587 -.00000076  00000-0  99999-4 0  5167
2 03029  13.5495  18.8141 0020616 228.2239 131.5812  1.00272828 85610
Cosmos 398
1 04966U 71 16  A 91 87.36624618  .00112529  19153-4  57093-3 0  4626
2 04966  51.5224 220.2253 2073263 342.3603  11.4459 11.48978241623657
Starlette
1 07646U 75010  A 91 84.18765549 -.00000011  00000-0  39040-4 0  2001
2 07646  49.8214 129.6907 0205943  39.2672 322.2958 13.82151427814647
LAGEOS
1 08820U 76039  A 91 87.32193512  .00000009  00000-0  20291-1 0  2159
2 08820 109.8386  92.4661 0044371 178.1536 181.9085  6.38664186 92082
GOES 2
1 10061U 77048  A 91 81.83406437 -.00000258  00000-0  99999-4 0  5685
2 10061   8.7256  60.3239 0003974 343.5407  16.4844  1.00263027 51802
IUE
1 10637U 78012  A 91 81.95684994 -.00000181  00000-0  79862-4 0  2190
2 10637  32.7391 114.3506 1412662   0.8255 359.4843  1.00292483  9268
GPS-0001
1 10684U 78020  A 91 86.14944999  .00000004  00000-0  99999-4 0  6113
2 10684  63.9007  80.7687 0128011 200.6174 158.9223  2.00553923 81520
GPS-0002
1 10893U 78 47  A 91 87.14698115 -.00000022  00000-0  99999-4 0  3276
2 10893  64.2163 321.6110 0171643  23.6742 337.1388  2.00534864 94362
GOES 3
1 10953U 78062  A 91 75.18784986  .00000090  00000-0  99999-4 0   533
2 10953   7.5973  63.3168 0003190 104.1918 255.8528  1.00264070  7647
SeaSat 1
1 10967U 78064  A 91 86.22024352  .00003484  00000-0  12293-2 0  4850
2 10967 108.0143 184.5997 0003102 231.8958 128.1989 14.36392014667085
GPS-0003
1 11054U 78093  A 91 81.90630089 -.00000021  00000-0  99999-4 0  3595
2 11054  63.7821 317.9333 0063699 117.5006 243.2015  2.00571830 91274
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Nimbus 7
1 11080U 78098  A 91 86.73693432  .00000357  00000-0  35308-3 0  7370
2 11080  99.1750 349.9490 0009613  47.9953 312.2033 13.83526670627243
GPS-0004
1 11141U 78112  A 91 83.52638714  .00000004  00000-0  99999-4 0  1438
2 11141  63.8404  80.7519 0061491 311.2873  48.2041  2.00546529 90002
GPS-0005
1 11690U 80 11  A 91 85.16018338  .00000005  00000-0  99999-4 0  1020
2 11690  64.3323  82.9762 0123376 203.3010 156.1709  2.00552850 95892
GPS-0006
1 11783U 80 32  A 91 87.44957955 -.00000021  00000-0  99999-4 0  3971
2 11783  63.5635 317.2486 0151102  58.4164 303.1362  2.00575558 80024
GOES 5
1 12472U 81049  A 91 84.08197937  .00000132  00000-0  99999-4 0   620
2 12472   4.1664  72.2821 0002962 273.9420  86.2933  1.00246535 35046
Cosmos 1383
1 13301U 82 66  A 91 87.06346128  .00000234  00000-0  26252-3 0  6913
2 13301  82.9298  92.7348 0028907  96.6597 263.7853 13.67896682436484
LandSat 4
1 13367U 82 72  A 91 88.10154894  .00003319  00000-0  74469-3 0  7196
2 13367  98.1263 149.4108 0003687 351.0433   9.0668 14.57196126462790
IRAS
1 13777U 83  4  A 91 86.02437821  .00000362  00000-0  27469-3 0  9128
2 13777  99.0138 283.2803 0012313 329.1255  30.9195 13.98911137 86486
Cosmos 1447
1 13916U 83 21  A 91 85.21628506  .00000312  00000-0  31889-3 0  7869
2 13916  82.9421 163.5484 0039559  72.7894 287.7592 13.74124344401409
TDRS 1
1 13969U 83 26  B 91 86.13954591  .00000126  00000-0  99999-4 0  2911
2 13969   5.1561  63.2518 0003346 311.9954  48.0953  1.00269942  2184
GOES 6
1 14050U 83 41  A 91 84.08072611  .00000115  00000-0  99999-4 0  3926
2 14050   2.9299  75.2925 0019092 201.1886 159.1480  1.00275977   950
OSCAR 10
1 14129U 83 58  B 91 87.13157047 -.00000090  00000-0  99999-4 0  6439
2 14129  25.8083 153.6070 6004385 228.6767  61.5135  2.05883150 30580
GPS-0008
1 14189U 83 72  A 91 83.89174778  .00000003  00000-0  99999-4 0  9043
2 14189  63.5092  79.0657 0144314 224.7843 134.0615  2.00568544 56398
LandSat 5
1 14780U 84 21  A 91 88.13594721  .00000428  00000-0  99999-4 0  5677
2 14780  98.2389 149.4861 0002229 359.6248   0.5098 14.57110952376212
UoSat 2
1 14781U 84 21  B 91 87.59505918  .00005188  00000-0  94170-3 0  9472
2 14781  97.9121 135.3744 0013772  62.2623 298.0072 14.66570353377634
GPS-0009
1 15039U 84 59  A 91 82.56909161  .00000002  00000-0  99999-4 0  1736
2 15039  63.2602  78.2238 0028431 227.2839 132.4876  2.00565697 49644
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Cosmos 1574
1 15055U 84 62  A 91 83.76460814  .00000320  00000-0  33238-3 0   373
2 15055  82.9572 215.4515 0026076 263.7182  96.1014 13.73430219338585
GPS-0010
1 15271U 84 97  A 91 84.00992443 -.00000021  00000-0  99999-4 0   171
2 15271  63.0692 316.7698 0112595 331.9116  27.5379  2.00564337 46789
Cosmos 1602
1 15331U 84105  A 91 86.04058038  .00009232  00000-0  12133-2 0  5087
2 15331  82.5332  98.4831 0024140 123.3775 236.9856 14.79927502349898
NOAA 9
1 15427U 84123  A 91 87.20021879  .00001658  00000-0  91076-3 0  7186
2 15427  99.1731  98.7687 0014218 293.9234  66.0445 14.12919510324089
GPS-0011
1 16129U 85 93  A 91 87.21911500  .00000003  00000-0  99999-4 0  7347
2 16129  64.0328  79.2925 0122702 147.9506 212.8119  2.00564791 40051
Mir
1 16609U 86 17  A 91 88.12594994  .00067853  00000-0  67618-3 0  3447
2 16609  51.6071 333.5097 0015537 116.0173 244.2519 15.64886640292620
SPOT 1
1 16613U 86 19  A 91 86.11334519  .00001847  00000-0  88512-3 0  2701
2 16613  98.7031 161.4517 0001635  93.7128 266.4256 14.20052388104084
Cosmos 1766
1 16881U 86 55  A 91 87.69099382  .00009069  00000-0  12083-2 0  3689
2 16881  82.5242 155.6658 0022196 136.1765 224.1232 14.79373734251185
EGP
1 16908U 86 61  A 91 79.36376868 -.00000025  00000-0  99999-4 0  3427
2 16908  50.0101 126.9583 0011374 178.0562 182.0318 12.44393283209241
NOAA 10
1 16969U 86 73  A 91 86.97583158  .00002033  00000-0  90085-3 0  5624
2 16969  98.5727 113.2251 0013806 160.0598 200.1146 14.24017780234998
MOS-1
1 17527U 87 18  A 91 83.10464767  .00000755  00000-0  58738-3 0  7676
2 17527  99.0738 156.6296 0000824  78.8797 281.2461 13.94886759208289
GOES 7
1 17561U 87 22  A 91 85.78858133 -.00000045  00000-0  99999-4 0  7486
2 17561   0.0121 184.9505 0005799 197.9842 336.9736  1.00271905  8402
Kvant-1
1 17845U 87 30  A 91 88.12593937  .00070670  00000-0  70274-3 0  5155
2 17845  51.6060 333.5106 0018226 114.9043 245.3001 15.64864560227356
DMSP B5D2-3
1 18123U 87 53  A 91 88.17718377  .00001898  00000-0  10088-2 0  8887
2 18123  98.8149 279.9667 0013819 294.5231  65.4506 14.14466555194685
RS-10/11
1 18129U 87 54  A 91 87.84980366  .00000097  00000-0  99999-4 0  5670
2 18129  82.9242 118.2301 0013169  54.1551 306.0829 13.72165370188579
Meteor 2-16
1 18312U 87 68  A 91 83.45954500  .00000225  00000-0  19326-3 0  6155
2 18312  82.5514  68.1463 0011585 179.1794 180.9388 13.83749620181749
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Meteor 2-17
1 18820U 88  5  A 91 83.62243123  .00000420  00000-0  36624-3 0  4641
2 18820  82.5438 127.5364 0015019 256.8532 103.0952 13.84460246158985
DMSP B5D2-4
1 18822U 88  6  A 91 88.17730476  .00002440  00000-0  11232-2 0  8242
2 18822  98.6072 325.7611 0006702 157.1734 202.9743 14.21900540163310
Glonass 34
1 19163U 88 43  A 91 87.51736566  .00000020  00000-0  99999-4 0  2081
2 19163  64.9161 149.6608 0007156 198.3132 161.7389  2.13102426 22201
Glonass 36
1 19165U 88 43  C 91 87.57424372  .00000020  00000-0  99999-4 0  2000
2 19165  64.8972 149.6520 0004596 326.3785  33.6674  2.13102816 22204
AO-13
1 19216U 88 51  B 91 65.03461838 -.00000020  00000-0  99999-4 0  2406
2 19216  56.8208 107.0310 7134717 248.7854  25.7533  2.09700788 20895
OKEAN 1
1 19274U 88 56  A 91 87.54404986  .00005773  00000-0  78595-3 0   759
2 19274  82.5066 254.5317 0019301 272.7553  87.1454 14.78489059146919
Meteor 3-2
1 19336U 88 64  A 91 79.51407238  .00000049  00000-0  10968-3 0  7149
2 19336  82.5407  81.9375 0017539 348.1699  11.9013 13.16915477127322
Glonass 39
1 19503U 88 85  C 91 87.12467280 -.00000018  00000-0  99999-4 0  1241
2 19503  65.4483  29.0113 0004601 202.5931 157.3691  2.13103385 19681
NOAA 11
1 19531U 88 89  A 91 88.21240260  .00002006  00000-0  11146-2 0  4735
2 19531  99.0216  42.4460 0011494 196.6004 163.4793 14.12038892129185
TDRS 2
1 19548U 88 91  B 91 76.99844941  .00000113  00000-0  99999-4 0  2340
2 19548   0.7936  80.3119 0002824 288.6783 351.0985  1.00277359  7668
Glonass 40
1 19749U 89  1  A 91 87.63537953  .00000020  00000-0  99999-4 0  9119
2 19749  64.8647 149.3135 0007260 275.3586  84.6412  2.13101861 17224
Glonass 41
1 19750U 89  1  B 91 87.22422455  .00000020  00000-0  99999-4 0  9644
2 19750  64.8885 149.3576 0007283 256.3964 103.6021  2.13102065 17217
GPS BII-01
1 19802U 89 13  A 91 58.17527061  .00000017  00000-0  99999-4 0  2319
2 19802  55.0455 187.3559 0050904 163.2354 196.8890  2.00558153 14865
Akebono
1 19822U 89 16  A 91 87.64075857  .00035161  00000-0  20168-2 0  9729
2 19822  75.0720  97.7820 4104260  37.9314 344.9503  7.25550075 20244
Meteor 2-18
1 19851U 89 18  A 91 86.27035091  .00000701  00000-0  62028-3 0  4186
2 19851  82.5215   2.8990 0013536 297.1198  62.8595 13.84098645104729
MOP-1
1 19876U 89 20  B 91 75.51745988  .00000024  00000-0  99999-4 0  1828
2 19876   0.3174  51.0207 0001591 304.5416   4.4358  1.00271682  3398
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TDRS 3
1 19883U 89 21  B 91 74.63397740 -.00000237  00000-0  99999-4 0  2332
2 19883   0.8223  79.6338 0003135 292.2952 348.0983  1.00264151 77611
GPS BII-02
1 20061U 89 44  A 91 58.00437706 -.00000034  00000-0  99999-4 0  2332
2 20061  54.8640   5.4895 0089842 183.4176 176.5173  2.00566400 12602
Nadezhda 1
1 20103U 89 50  A 91 87.03399046  .00000441  00000-0  45831-3 0  3129
2 20103  82.9576  75.7689 0037562 330.9419  28.9642 13.73667931 86684
GPS BII-03
1 20185U 89 64  A 91 57.34599602  .00000016  00000-0  99999-4 0  1766
2 20185  54.8906 188.1900 0021289 164.8064 195.2144  2.00568043 11161
GPS BII-04
1 20302U 89 85  A 91 41.91577973 -.00000024  00000-0  99999-4 0  1785
2 20302  54.4598 307.3315 0032510 329.9999  29.8633  2.00556091  9656
Meteor 3-3
1 20305U 89 86  A 91 83.78492777  .00000043  00000-0  99999-4 0  3274
2 20305  82.5503  20.0872 0016660 355.5322   4.5673 13.15942710 67852
COBE
1 20322U 89 89  A 91 87.06371303  .00000756  00000-0  50921-3 0  2622
2 20322  99.0230  99.6997 0008684 307.3650  52.6725 14.03027467 69290
Kvant-2
1 20335U 89 93  A 91 88.06208057  .00070558  00000-0  70274-3 0  6159
2 20335  51.5981 333.8406 0015857 111.0311 249.1593 15.64877492 76273
GPS BII-05
1 20361U 89 97  A 91 85.49999999  .00000013  00000-0  99999-4 0  1349
2 20361  55.0220 129.1670 0065101  62.1330  79.8190  2.00558849    07
SPOT 2
1 20436U 90  5  A 91 86.07834018  .00001952  00000-0  93391-3 0  5074
2 20436  98.7036 161.4970 0000682  81.2530 278.8723 14.20070426 60899
UO-14
1 20437U 90  5  B 91 87.70628769  .00001612  00000-0  65281-3 0  3203
2 20437  98.6784 167.6671 0012203  42.3198 317.9034 14.29009848 61491
UO-15
1 20438U 90  5  C 91 86.25005774  .00000986  00000-0  40850-3 0  2003
2 20438  98.6768 166.1051 0010915  47.3252 312.8863 14.28622663 61279
PACSAT
1 20439U 90  5  D 91 87.18620936  .00001527  00000-0  61808-3 0  2110
2 20439  98.6768 167.4050 0012088  48.9803 311.2447 14.29098619 61422
DO-17
1 20440U 90  5  E 91 86.26097029  .00001580  00000-0  63769-3 0  2118
2 20440  98.6766 166.5200 0012095  52.3672 307.8631 14.29168280 61293
WO-18
1 20441U 90  5  F 91 86.44382880  .00001569  00000-0  63259-3 0  2101
2 20441  98.6739 166.7423 0012699  51.3876 308.8507 14.29229004 61327
LO-19
1 20442U 90  5  G 91 87.19266508  .00001497  00000-0  60371-3 0  2127
2 20442  98.6767 167.5436 0013001  48.2439 311.9890 14.29306365 61438
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GPS BII-06
1 20452U 90  8  A 91 67.75229359  .00000004  00000-0  99999-4 0  1530
2 20452  54.3982 245.2075 0046174  52.4825 307.8626  2.00554625  8154
MOS-1B
1 20478U 90 13  A 91 87.72924002 -.00000004  00000-0  99999-5 0  5244
2 20478  99.1494 161.2887 0000866  94.4406 265.2414 13.94844363 57808
DEBUT
1 20479U 90 13  B 91 69.51316501  .00000031  00000-0  97835-4 0  1893
2 20479  99.0193  70.4245 0540988 165.0177 196.7681 12.83171893 50903
FO-20
1 20480U 90 13  C 91 86.98392873  .00000105  00000-0  28514-3 0  1834
2 20480  99.0230  84.5750 0541449 125.5056 239.7812 12.83179882 53143
MOS-1B R/B
1 20491U 90 13  D 91 84.98276016  .00000007  00000-0  38769-4 0  2100
2 20491  99.0157  94.4869 0471238  90.6784 274.8333 13.02815313 53092
LACE
1 20496U 90 15  A 91 87.68127558  .00023333  00000-0  12071-2 0  4759
2 20496  43.0891 194.9510 0020647 335.7107  24.2754 15.15643687 61683
RME
1 20497U 90 15  B 91 87.96635854  .00042635  00000-0  85272-3 0  5081
2 20497  43.1013 101.1943 0018550  60.7599 299.4852 15.45896569 62746
Nadezhda 2
1 20508U 90 17  A 91 83.74503768  .00000376  00000-0  39133-3 0  2668
2 20508  82.9544 213.0215 0043191 286.1510  73.4913 13.73287326 53517
OKEAN 2
1 20510U 90 18  A 91 87.95668595  .00009299  00000-0  13871-2 0  4462
2 20510  82.5287 195.2400 0020759  70.0628 290.2791 14.74593259 58012
INTELSAT-6
1 20523U 90 21  A 91 62.01325021  .00008107  00000-0  57046-3 0  4497
2 20523  28.3339   6.7184 0014890  76.4736 283.7514 15.03209790 53423
GPS BII-07
1 20533U 90 25  A 91 87.10831997 -.00000034  00000-0  99999-4 0  1441
2 20533  55.1855   4.4877 0034366  96.5006 263.8942  2.00566691  7312
PegSat
1 20546U 90 28  A 91 87.74349843  .00038495  00000-0  20079-2 0  4762
2 20546  94.1442   7.1579 0138473  25.6788 335.0911 15.07800751 52838
HST
1 20580U          91 86.77285543  .00012573  00000-0  13568-2 0  4033
2 20580  28.4683 242.6984 0005687 185.3941 174.6582 14.86980261 50182
Glonass 44
1 20619U 90 45  A 91 87.06701028 -.00000018  00000-0  99999-5 0  4204
2 20619  65.0499  29.2039 0022517 219.0906 140.7253  2.13102713  6673
Glonass 45
1 20620U 90 45  B 91 87.65415568 -.00000018  00000-0  99999-4 0  4357
2 20620  65.0302  29.2067 0007894  24.7196 335.3032  2.13102955  6699
Glonass 46
1 20621U 90 45  C 91 87.24370679 -.00000018  00000-0  99999-4 0  3704
2 20621  65.0616  29.2203 0012596 211.2389 148.6762  2.13102533  6688
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Kristall
1 20635U 90 48  A 91 88.12594122  .00070577  00000-0  70274-3 0  4151
2 20635  51.6063 333.5094 0015481 114.6944 245.5271 15.64891117 47161
ROSAT
1 20638U 90 49  A 91 87.80841970  .00009975  00000-0  80618-3 0  2217
2 20638  52.9879 225.7565 0016316 123.6913 236.5645 15.00271662 44969
Meteor 2-19
1 20670U 90 57  A 91 87.00799621  .00000406  00000-0  35581-3 0  1633
2 20670  82.5413  63.3643 0014875 207.0448 153.0109 13.83930967 37777
CRRES
1 20712U 90 65  A 91 87.68253252  .00003268  00000-0  33602-2 0  1830
2 20712  17.9889 305.5275 7118839  28.7371 356.6070  2.44164154  6013
GPS BII-08
1 20724U 90 68  A 91 55.54435681  .00000016  00000-0  99999-4 0   845
2 20724  54.6996 186.1883 0096447 122.6748 238.2165  2.00563932  4103
Feng Yun1-2
1 20788U 90 81  A 91 87.59876210 -.00000401  00000-0 -25542-3 0  1211
2 20788  98.9489 122.7652 0015466  46.6461 313.6037 14.01090103 28921
Meteor 2-20
1 20826U 90 86  A 91 87.78580277  .00000650  00000-0  58228-3 0  1182
2 20826  82.5194   1.8190 0014176 103.2175 257.0610 13.83311453 25095
GPS BII-09
1 20830U 90 88  A 91 76.52119715  .00000013  00000-0  99999-4 0   862
2 20830  54.9253 127.6215 0078982 125.4478 235.5880  2.00567872  3609
GPS BII-10
1 20959U 90103  A 91 76.43064871  .00000017  00000-0  99999-4 0   262
2 20959  54.9591 186.9802 0045402 213.8318 146.2541  2.00567535  2193
DMSP B5D2-5
1 20978U 90105  A 91 88.21446375  .00002230  00000-0  83757-3 0  1025
2 20978  98.8449 123.6445 0081178  14.4195 345.9274 14.30783436 16813
Soyuz TM-11
1 20981U 90107  A 91 88.06211545  .00070556  00000-0  70274-3 0  1209
2 20981  51.6035 333.8375 0015827 115.8787 244.5261 15.64877297 18261
Glonass 47
1 21006U 90110  A 91 87.28284723  .00000020  00000-0  99999-4 0  1040
2 21006  64.8355 148.7415 0061834 186.6653 173.3246  2.13102212  2360
Glonass 48
1 21007U 90110  B 91 87.45945085  .00000020  00000-0  99999-4 0  1180
2 21007  64.8566 148.7647 0039362 181.2590 178.8025  2.13100253  2362
Glonass 49
1 21008U 90110  C 91 86.40374980  .00000020  00000-0  99999-4 0  1006
2 21008  64.8367 148.7850 0010610 290.5440  69.4138  2.13100291  2341
INFORMTR-1
1 21087U          91 87.14616669  .00000289  00000-0  29279-3 0   264
2 21087  82.9427 293.6967 0036275 122.5402 237.9267 13.74359194  7899
Cosmos 2123
1 21089U 91  7  A 91 83.72491363  .00000292  00000-0  30027-3 0   284
2 21089  82.9293 166.7116 0029654 151.3646 208.9150 13.73876059  6544
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1991 013B
1 21131U 91 13  B 91 87.37082331  .00000344  00000-0  32170-3 0   149
2 21131  82.8217 233.8901 0059447 189.6162 170.4023 13.79141269  4167
Raduga 27
1 21132U 91 14  A 91 86.82309371 -.00000319  00000-0  99999-4 0   265
2 21132   1.4507 250.2539 0002292 335.5193  23.5243  1.00255572   307
1991 014D
1 21135U 91 14  D 91 85.11882248 -.00000046  00000-0  99999-4 0   119
2 21135   1.4747 250.4177 0022303 345.7946  13.3059  1.03433899   293
ASTRA 1-B
1 21139U 91 15  A 91 80.46373186  .00000118  00000-0  99999-4 0   123
2 21139   0.1832 294.3883 0020087  37.5727  27.8979  1.01108902   102
MOP-2
1 21140U 91 15  B 91 86.31931506 -.00000004  00000-0  99999-4 0   238
2 21140   1.1632 296.5597 0002346   9.4124 349.1554  1.00292897    44
1991 015C
1 21141U 91 15  C 91 86.97524633  .00026142  00000-0  76504-2 0   291
2 21141   6.9883 319.6013 7296819 197.5430 108.4788  2.26079931   543
1991 015D
1 21142U 91 15  D 91 86.07321224  .00098050  00000-0  15438-1 0   233
2 21142   7.0030 318.4461 7259555 198.6120 102.8768  2.32146323   541
Cosmos 2136
1 21143U 91 16  A 91 79.06154793  .00291944  40811-4  13822-3 0   345
2 21143  62.8479 292.8576 0034428 108.8787 251.6612 16.19681410  2156
INMARSAT 2
1 21149U 91 18  A 91 86.29988487  .00000041  00000-0  99999-4 0   136
2 21149   2.7054 295.8629 0005689 331.5938  27.8240  1.00258298   220
1991 018B
1 21150U 91 18  B 91 87.54351110  .00022297  00000-0  16536-2 0   191
2 21150  24.9688 205.3365 0527598 358.2480   1.6175 14.30897285  2805
1991 018C
1 21151U 91 18  C 91 73.10362640  .00059200  00000-0  75036-2 0   104
2 21151  24.2144 326.6542 7339464 189.2262 143.2853  2.22645047   124
Nadezhda 3
1 21152U 91 19  A 91 85.64088130  .00000006  00000-0  00000 0 0   114
2 21152  82.9238 120.0253 0040306 253.7699 105.9019 13.73320043  1903
1991 019B
1 21153U 91 19  B 91 87.59214839  .00006419  00000-0  66974-2 0   173
2 21153  82.9279 118.5589 0040289 227.9020 131.8689 13.74790668  2170
Progress M7
1 21188U 91 20  A 91 88.06210297 -.00078055  00000-0 -78955-3 0   338
2 21188  51.6088 333.8446 0015736 121.3796 238.9708 15.64865076  1503
1991 021A
1 21190U 91 21  A 91 86.23397815  .00033442  00000-0  10708-2 0   139
2 21190  65.8455 351.3492 0033069 337.6460  22.3243 15.31704089  1178
1991 021B
1 21191U 91 21  B 91 87.92382712  .00005067  00000-0  16088-3 0   193
2 21191  65.8475 345.9153 0038373 347.6195  12.2042 15.33075485  1430
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1991 016E
1 21192U 91 16  E 91 79.73853936  .02463812  42861-4  13822-3 0    16
2 21192  62.8486 290.1035 0022662 152.0986 216.3501 16.39550032  2262
1991 016F
1 21193U 91 16  F 91 80.84824936  .02354843  41305-4  63741-3 0    53
2 21193  62.8487 285.6101 0025941 108.6674 252.1455 16.26689870  2446
1991 016G
1 21194U 91 16  G 91 79.68737118  .00078525  10298-4  13822-3 0    26
2 21194  62.8319 290.3965 0113656 358.8627   1.1627 15.91001002  2269
1991 016H
1 21195U 91 16  H 91 80.62336843 -.00005878  40651-4  00000 0 0    10
2 21195  62.8865 286.7585 0106886 325.5535  33.7995 16.16433098  2406
1991 022A
1 21196U 91 22  A 91 86.91937716  .00000391  00000-0  20810-2 0    98
2 21196  62.8441 313.4082 7434016 280.3620   2.6418  2.00796821   122
1991 022B
1 21197U 91 22  B 91 87.28548238  .01740400  38873-4  13458-2 0   150
2 21197  62.8281 292.1374 0124472 133.0420 228.1284 15.99827254   931
1991 022C
1 21198U 91 22  C 91 87.48717799  .28549576  43954-4  22676-3 0   242
2 21198  62.7987 290.9135 0035682 128.1504 232.8195 16.49025913   972
1991 022D
1 21199U 91 22  D 91 85.45630745 -.00003244  00000-0 -20478-1 0    36
2 21199  62.8417 313.4179 7379888 280.6496  11.0228  2.05618352    90
1991 022E
1 21200U 91 22  E 91 87.02175629  .05087617  40482-4  16976-2 0   152
2 21200  62.8106 293.0460 0093132 129.9541 231.5212 16.14879063   891
1991 014E
1 21201U 91 14  E 91 85.47696117  .00002623  00000-0  16250-2 0    41
2 21201  47.5363 241.8354 7223998   6.6903 359.1028  2.32925363   639
1991 014F
1 21202U 91 14  F 91 83.71017768  .00008534  00000-0  19110-2 0    18
2 21202  47.5153 242.3179 7242052   6.2255 359.2131  2.33509150   590
1991 023A
1 21203U 91 23  A 91 87.86284019  .01188773  28187-4  29857-3 0    86
2 21203  67.1483   8.6785 0121716  92.7877 268.8935 16.12190262   372
1991 023B
1 21204U 91 23  B 91 87.84647494  .18280002  30103-4  33209-3 0   134
2 21204  67.1627   8.6511 0046059  91.9560 269.0962 16.41670542   375
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Date: 29 Mar 91 16:30:53 GMT
From: hpda!hpcuhb!hpsqf!hpqmola!hpqmolb!dstock@hplabs.hpl.hp.com
Subject: Re: Newer HF rigs

To: info-hams@ucsd.edu

One of the major strengths of the TR7 is that it has a VFO and not a synthesiser.

Producing a good enough synth to replace the VFO and not lose performance is not a light undertaking, many commercial rigs have demonstrated that this could not be done within their price constraints, some rigs caused me to wonder if thier manufacturers could even have succeeded with money no object as they could have beed done better at no extra cost (no names, no pack drill..)

Good enough synthesisers can be made, but only now is the cost coming down into reach.

It is the thought of wear of tuning mechanisms that put me off of otherwise interesting boxes like the TR7 and corsair. Mind you, I've seen paragons and an omniV with much play on the main knob - how long will plain bushes last ? my old racal had standard sized ball races. Rigs cost double price over here, we have to choose carefully :-(

73 de GM4ZNX

Date: 28 Mar 91 13:08:34 GMT
From: pacbell.com!att!emory!wa4mei!ke4zv!gary@ucsd.edu
Subject: VHF/UHF antenna design [a mathematical approach]
To: info-hams@ucsd.edu

In article <3552@autodesk.COM> abeals@Autodesk.COM (Anything you don't mean can't hurt you) writes:
>I'm looking for a book that describes VHF and UHF antenna designs
>from a mathematical approach.
>
>This is to say that while every other ham book I have read about antenna
>design may be correct, I want to do the math for myself.

The book _Antennas_ by John Kraus W8JK sounds like what you are looking for. It approaches antenna design from a theoretical standpoint. Also, there is a program _Mininec_ that does antenna pattern calculations for you. Highly recomended. John Kraus, by the way, is Director of Ohio State's Radio Astronomy Observatory. NBS, now NIST, also put out a design pamplet on optimizing long boom yagis that may be of interest. Computing the performance of an antenna design is not trivial. Generally you must iterate a solution based on a finite element analysis of the radiating structures.

Gary KE4ZV

Date: 30 Mar 91 22:15:51 GMT
From: usc!wuarchive!m.cs.uiuc.edu!ux1.cso.uiuc.edu!phil@ucsd.edu
To: info-hams@ucsd.edu

References <1991Mar27.061649.17157@lopez.UUCP>,
<1991Mar27.235352.17436@informix.com>, <1991Mar29.180531.2137@lopez.UUCP>
Subject : Re: The RAMSEY FM-10 STEREO TRANSMITTER KIT REVIEW (Longish)

A friend of mine is interested in using one of these FM transmitter kits to transmit over a small area. I want to make sure that whatever frequency I set him up on (I have a couple possible in mind that seem to be clear enough) is very stable. What I am wondering is if any kits are made like this but based on a better frequency reference, like a crystal.

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 /***************************************************************************\
/ Phil Howard -- KA9WGN -- phil@ux1.cso.uiuc.edu                              \
\ Lietuva laisva -- Brivu Latviju -- Eesti vabaks                             /
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End of Info-Hams Digest
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